



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

NATIONAL EXPOSURE RESEARCH LABORATORY

HUMAN EXPOSURE & ATMOSPHERIC SCIENCES DIVISION (MD-46)

Research Triangle Park, NC 27711

919-541-2622

Office of
Research and Development

LIST OF DESIGNATED REFERENCE AND EQUIVALENT METHODS

Issue Date: October 1, 1997

These methods for measuring ambient concentrations of specified air pollutants have been designated as "reference methods" or "equivalent methods" in accordance with Title 40, Part 53 of the Code of Federal Regulations (40 CFR Part 53). Subject to any limitations (e.g., operating range) specified in the applicable designation, each method is acceptable for use in state or local air quality surveillance systems under 40 CFR Part 58 unless the applicable designation is subsequently canceled. Automated methods are acceptable for use at shelter temperatures between 20°C and 30°C and line voltages between 105 and 125 volts unless wider limits are specified in the method description.

Prospective users of the methods listed should note (1) that each method must be used in strict accordance with its associated operation or instruction manual and with applicable quality assurance procedures, and (2) that modification of a method by its vendor or user may cause the pertinent designation to be inapplicable to the method as modified. (See Section 2.8 of Appendix C, 40 CFR Part 58 for approval of modifications to any of these methods by users.)

Further information concerning particular designations may be found in the *Federal Register* notice cited for each method or by writing to the National Exposure Research Laboratory, Human Exposure and Atmospheric Sciences Division (MD-46), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. Technical information concerning the methods should be obtained by contacting the source listed for each method. Source addresses are listed at the end of the listing of methods, except for the addresses for lead method sources, which are given with the method. New analyzers or PM₁₀ samplers sold as reference or equivalent methods must carry a label or sticker identifying them as designated methods. For analyzers or PM₁₀ samplers sold prior to the designation of a method with the same or similar model number, the model number does not necessarily identify an analyzer or sampler as a designated method. Consult the manufacturer or seller to determine if a previously sold analyzer or sampler can be considered a designated method or if it can be upgraded to designation status. Analyzer users who experience operational or other difficulties with a designated analyzer or sampler and are unable to resolve the problem directly with the instrument manufacturer may contact EPA (preferably in writing) at the above address for assistance.

This list will be revised as necessary to reflect any new designations or any cancellation of a designation currently in effect. The most current revision of the list will be available for inspection at EPA's Regional Offices, and copies may be obtained by writing to the National Exposure Research Laboratory at the address specified above.

Designations since March 1996

DKK Corporation Model GFS-32 UV Fluorescent SO₂ Analyzer

Horiba Instruments, Inc. Model APOA-360 Ambient O₃ Monitor

Horiba Instruments, Inc. Model APNA-360 Ambient NO-NO₂-NO_X Monitor

Horiba Instruments, Inc. Model APSOA-360 Ambient SO₂ Monitor

Lead - Inductively Coupled Argon Plasma-Optical Emission Spectrometry (Doe Run Company)

PARTICULATE MATTER - TSP**Reference Method for TSP***Manual Reference Method: 40 CFR Part 50, Appendix B*

Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High-Volume Method)

[Federal Register: Vol 47, page 54912, 12/06/82 and Vol 48, page 17355, 04/22/83]

PARTICULATE MATTER - PM₁₀**Graseby Andersen/GMW Model 1200 High-Volume Air Sampler***Manual Reference Method: RFPS-1287-063*

"Sierra-Andersen or General Metal Works Model 1200 PM₁₀ High-Volume Air Sampler System," consisting of a Sierra-Andersen or General Metal Works Model 1200 PM₁₀ Size-Selective Inlet and any of the high-volume air samplers identified as SAUV-10H, SAUV-11H, GMW-IP-10, GMW-IP-10-70, GMW-IP-10-801, or GMW-IP-10-8000, which include the following components:

Anodized aluminum high-volume shelter with either acrylonitrile butadiene styrene plastic filter holder and motor/blower housing or stainless steel filter holder and phenolic plastic motor/blower housing; 0.6 hp motor/blower; pressure transducer flow recorder; either an electronic mass flow controller or a volumetric flow controller; either a digital timer/programmer, seven-day mechanical timer, six-day timer/programmer, or solid-state timer/programmer; elapsed time indicator; and filter cartridge.

[Federal Register: Vol 52, page 45684, 12/01/87 and Vol 53, page 1062, 01/15/88]

Graseby Andersen/GMW Model 321-B High-Volume Air Sampler*Manual Reference Method: RFPS-1287-064*

"Sierra-Andersen or General Metal Works Model 321-B PM₁₀ High-Volume Air Sampler System," consisting of a Sierra-Andersen or General Metal Works Model 321-B PM₁₀ Size-Selective Inlet and any of the high-volume air samplers identified as SAUV-10H, SAUV-11H, GMW-IP-10, GMW-IP-10-70, GMW-IP-10-801, or GMW-IP-10-8000, which include the following components:

Anodized aluminum high-volume shelter with either acrylonitrile butadiene styrene plastic filter holder and motor/blower housing or stainless steel filter holder and phenolic plastic motor/blower housing; 0.6 hp motor/blower; pressure transducer flow recorder; either an electronic mass flow controller or a volumetric flow controller; either a digital timer/programmer, seven-day mechanical timer, six-day timer/programmer, or solid-state timer/programmer; elapsed time indicator; and filter cartridge.

[Federal Register: Vol 52, page 45684, 12/01/87 and Vol 53, page 1062, 01/15/88]

Graseby Andersen/GMW Model 321-C High-Volume Air Sampler*Manual Reference Method: RFPS-1287-065*

"Sierra-Andersen or General Metal Works Model 321-C PM₁₀ High-Volume Air Sampler System," consisting of a Sierra-Andersen General Metal Works Model 321-C PM₁₀ or Size-Selective Inlet and any of the high-volume air samplers identified as SAUV-10H, SAUV-11H, GMW-IP-10, GMW-IP-10-70, GMW-IP-10-801, or GMW-IP-10-8000, which include the following components: Anodized aluminum high-volume shelter with either acrylonitrile butadiene styrene plastic filter holder and motor/blower housing or stainless steel filter holder and phenolic plastic motor/blower housing; 0.6 hp motor/blower; pressure transducer flow recorder; either an electronic mass flow controller or a volumetric flow controller; either a digital timer/programmer, seven-day mechanical timer, six-day timer/programmer, or solid-state timer/programmer; elapsed time indicator; and filter cartridge.

[Federal Register: Vol 52, page 45684, 12/01/87 and Vol 53, page 1062, 01/15/88]

Graseby Andersen/GMW Models SA241 and SA241M Dichotomous Sampler*Manual Reference Method: RFPS-0789-073*

"Sierra-Andersen Models SA241 and SA241M or General Metal Works Models G241 and G241M PM₁₀ Dichotomous Samplers," consisting of the following components: Sampling Module with SA246b or G246b 10 μm inlet, 2.5 μm virtual impactor assembly, 37 mm coarse and fine particulate filter holders, and tripod mount; Control Module with diaphragm vacuum pump, pneumatic constant flow controller, total and coarse flow rotameters and vacuum gauges, pressure switch (optional), 24-hour flow/event recorder, digital timer/programmer or 7-day skip timer, and elapsed time indicator.

[Federal Register: Vol 54, page 31247, 07/27/89]

Graseby Andersen/GMW Model FH621-N Beta Monitor*Automated Equivalent Method: EQPM-0990-076*

"Andersen Instruments Model FH621-N PM₁₀ Beta Attenuation Monitor," consisting of the following components: FH101 Vacuum Pump Assembly; FH102 Accessory Kit; FH107 Roof Flange Kit; FH125 Zero and Span PM₁₀ Mass Foil Calibration Kit; FH62I Beta Attenuation 19-inch Control Module; SA246b PM₁₀ Inlet (16.7 liter/min); operated for 24-hour average measurements, with an observing time of 60 minutes, the calibration factor set to 2400, a glass fiber filter tape, an automatic filter advance after each 24-hour sample period, and with or without either of the following options: FH0P1 Indoor Cabinet; FH0P2 Outdoor Shelter Assembly.

[Federal Register: Vol 55, page 38387, 09/18/90]

Oregon DEQ Medium Volume PM₁₀ Sampler*Manual Reference Method: RFPS-0389-071*

"Oregon DEQ Medium Volume PM₁₀ Sampler." NOTE: This method is not now commercially available.

[Federal Register: Vol 54, page 12273,03/24/89]

Rupprecht & Patashnick TEOM Series 1400/1400a PM₁₀ Monitors*Automated Equivalent Method: EQPM-1090-079*

"Rupprecht & Patashnick TEOM Series 1400 and Series 1400a PM-10 Monitors," consisting of the following components: TEOM Sensor Unit; TEOM Control Unit; Flow Splitter (3 liter/min sample flow); Teflon-Coated Glass Fiber Filter Cartridges; Rupprecht & Patashnick PM-10 Inlet (part number 57-00596) or Sierra-Andersen Model 246b PM-10 Inlet (16.7 liter/min); operated for 24-hour average measurements, with the total mass averaging time set at 300 seconds, the mass rate/mass concentration averaging time set at 300 seconds, the gate time set at 2 seconds, and with or without any of the following options: Tripod; Outdoor Enclosure; Automatic Cartridge Collection Unit (Series 1400a only); Flow Splitter Adapter (for 1 or 2 liter/min sample flow).

[Federal Register: Vol 55, page 43406, 10/29/90]

Rupprecht & Patashnick Partisol Model 2000 Air Sampler*Automated Reference Method: RFPS-0694-098*

"Rupprecht & Patashnick Partisol Model 2000 Air Sampler," consisting of a Hub Unit and 0, 1, 2, or 3 Satellite Units, with each sampling station used for PM₁₀ measurements equipped with a Rupprecht & Patashnick PM-10 inlet and operated for continuous 24-hour periods using the Basic, Manual, Time, Analog Input, or Serial Input programming modes, and with or without any of the following options: 57-002320 Stand for Hub or Satellite; 59-002542 Advanced EPROM; 10-001403 Large Pump (1/4 hp); 120 VAC. Hardware for Indoor Installation consists of: 51-002638-xxxx Temperature Sensor (Extended Length); 55-001289 Roof Flange (1 1/4"); 57-000604 Support Tripod for Inlet; 57-002526-0001 Sample Tube Extension (1 m); 57-002526-0002 Sample Tube Extension (2 m). Hardware for Outdoor Installation in Extreme Cold Environments consists of: 10-002645 Insulating Jacket for Hub Unit.

[Federal Register: Vol 59, page 35338, 07/11/94]

Wedding & Associates' or Thermo Environmental Instruments Inc.*Manual Reference Method: RFPS-1087-062***Model 600 PM₁₀ High-Volume Sampler**

"Wedding & Associates' or Thermo Environmental Instruments, Inc. Model 600 PM₁₀ Critical Flow High-Volume Sampler," consisting of the following W&A/TEII components: PM₁₀ Inlet; Critical Flow Device; Anodized Aluminum Shelter; Blower Motor Assembly for 115, 220 or 240 VAC and 50/60 Hz; Mechanical Timer; Elapsed Time Indicator; and Filter Cartridge/Cassette, and with or without the following options: Digital Timer, 6 or 7 Day Timer, and 1 or 7 Day Pressure Recorder.

[Federal Register: Vol 52, page 37366, 10/06/87]

Wedding & Associates' or Thermo Environmental Instruments Inc.*Automated Equivalent Method: EQPM-0391-081***Model 650 PM₁₀ Beta Gauge**

"Wedding & Associates' or Thermo Environmental Instruments, Inc. Model 650 PM₁₀ Beta Gauge Automated Particle Sampler," consisting of the following W&A/TEII components: Particle Sampling Module, PM₁₀ Inlet (18.9 liter/min), Inlet Tube and Support Ring, Vacuum Pump (115, 220 or 240 VAC and 50/60 Hz); and operated for 24-hour average measurements with glass fiber filter tape.

[Federal Register: Vol 56, page 9216, 03/05/91]

NOTES

¹ Users should be aware that designation of this analyzer for operation on ranges less than the range specified in the performance specifications for this analyzer (40 CFR 53, Subpart B) is based on meeting the same absolute performance specifications required for the specified range. Thus, designation of these lower ranges does not imply commensurably better performance than that obtained on the specified range.

² This analyzer is approved for use, with proper factory configuration, on either 50 or 60 Hertz line frequency and nominal power line voltages of 115 Vac and 220 Vac.

Sources or Contacts for Designated Reference and Equivalent Methods

ABB Process Analytics P.O. Box 831 Lewisburg, WV 24901 (304) 647-4358	Environnement S.A 111, bd Robespierre 78300 Poissy, France Instruments also available from: Environnement U.S.A. 570 Higuera Street, Suite 25 San Luis Obispo, CA 93401 (805) 782- 9002	Opsis AB, Furulund, Sweden Instruments also available from: Opsis, Inc. 146-148 Sound Beach Avenue Old Greenwich, CT 06870 (203) 698-1810
Advanced Pollution Instrumentation, Inc. 8815 Production Avenue San Diego, CA 92121-2219 (619) 578-2154	Environics, Inc. 69 Industrial Park Rd. E. Tolland, CT 06084-2805 (203) 429-0077	State of Oregon Department of Environmental Quality Air Quality Division 811 S.W. Sixth Avenue Portland, OR 97204
ASARCO Incorporated 3422 South 700 West Salt Lake City, UT 84119 (801) 262-2459	Graseby Andersen 500 Technology Court Smyrna, GA 30082-9211 (800) 241-6898	PCI Ozone Corp. One Fairfield Crescent West Caldwell, NJ 07006 (201) 575-7052
Beckman Instruments, Inc. Process Instruments Division 2500 Harbor Blvd. Fullerton, CA 92634 (714) 871-4848	Graseby GMW 145 South Miami Cleves, OH 45002	Phillips Electronic Instruments, Inc. 85 McKee Drive Mahwah, NJ 07430
Bendix [Refer to ABB Process Analytics]	Horiba Instruments Incorporated 17671 Armstrong Avenue Irvine, CA 92714 (800) 446-7422	Rupprecht & Patashnik Co.,Inc. 25 Corporate Circle Albany, NY 12203 (518) 452-0065
Columbia Scientific Industries 11950 Jollyville Road Austin, TX 78759 (800) 531-5003	Lear Siegler [Refer to Monitor Labs, Inc.]	Thermo Environmental Instruments, Inc. 8 West Forge Parkway Franklin, MA 02038 (508) 520-0430
Combustion Engineering [Refer to ABB Process Analytics]	Commonwealth of Massachusetts Department of Environmental Quality Engineering Tewksbury, MA 01876	U.S. EPA National Exposure Research Laboratory
Dasibi Environmental Corp. 506 Paula Avenue Glendale, CA 91201 (818) 247-7601	McMillan [Refer to Columbia Scientific Industries]	Air Measurements Research Division MD-77B Research Triangle Park, NC 27711 (919) 541- 2622
DKK Corporation Musashino-shi Tokyo, 180, Japan	Mine Safety Appliances 600 Penn Center Blvd. Pittsburgh, PA 15235-5810 (412) 273-5101	Wedding and Associates, Inc. [Refer to Thermo Environmental Instruments, Inc.]
	Monitor Labs, Inc. 74 Inverness Drive Englewood, CO 80112-5189 (800) 422-1499	

U.S. EPA REFERENCE & EQUIVALENT METHODS FOR AMBIENT AIR

October 1, 1997

<u>Method</u>	<u>Designation Number</u>	<u>Method Code</u>	<u>Method</u>	<u>Designation Number</u>	<u>Method Code</u>			
SO₂ Manual Methods								
Reference method (pararosaniline)	--	097	Beckman 952A	RFNA-0179-034	034			
Technicon I (pararosaniline)	EQS-0775-001	097	Bendix 8101-B	RFNA-0479-038	038			
Technicon II (pararosaniline)	EQS-0775-002	097	Bendix 8101-C	RFNA-0777-022	022			
SO₂ Analyzers								
Advanced Pollution Instr. 100	EQSA-0990-077	077	Columbia Scientific Indust.1600, 5600	RFNA-0977-025	025			
Advanced Pollution Instr. 100A	EQSA-0495-100	100	Dasibi 2108	RFNA-1192-089	089			
Asarco 500	EQSA-0877-024	024	Environnement S.A. AC31M	RFNA-0795-104	104			
Beckman 953	EQSA-0678-029	029	Horiba APNA-360	RFNA-0196-111	111			
Bendix 8303	EQSA-1078-030	030	Lear Siegler or Monitor Labs ML9841, ML9841A, Monitor Labs ML9841B, Wedding 1030	RFNA-1292-090	090			
Columbia Scientific Industries 5700	EQSA-0494-095	095	Meloy NA530R	RFNA-1078-031	031			
Dasibi 4108	EQSA-1086-061	061	Monitor Labs 8440E	RFNA-0677-021	021			
DKK Corp, Model GFS-32	EQSA-0701-115	115	Monitor Labs or Lear Siegler 8840	RFNA-0280-042	042			
Environnement S.A. AF21M	EQSA-0292-084	084	Monitor Labs or Lear Siegler 8841	RFNA-0991-083	083			
Horiba Model APSA-360	EQSA-0197-114	114	Opsis AR 500, System 300 (open path)	EQNA-0495-102	102			
Lear Siegler AM2020	EQSA-1280-049	049	Philips PW9762/02	RFNA-0879-040	040			
Lear Siegler SM1000	EQSA-1275-005	005	Thermo Electron or Thermo Environmental Instruments 14B/E	RFNA-0179-035	035			
Lear Siegler or Monitor Labs ML9850, Monitor Labs ML9850B, Wedding 1040	EQSA-0193-092	092	Thermo Electron or Thermo Environmental Instruments 14D/E	RFNA-0279-037	037			
Meloy SA185-2A	EQSA-1275-006	006	Thermo Environmental Instr. 42, 42C	RFNA-1289-074	074			
Meloy SA285E	EQSA-1078-032	032	Pb Manual Methods					
Meloy SA700	EQSA-0580-046	046	Reference method (hi-vol/AA spect.)	--	803			
Monitor Labs 8450	EQSA-0876-013	513	Hi-vol/AA spect. (alt. extr.)	EQL-0380-043	043			
Monitor Labs or Lear Siegler 8850	EQSA-0779-039	039	Hi-vol/Energy-disp XRF (TX ACB)	EQL-0783-058	058			
Monitor Labs or Lear Siegler 8850S	EQSA-0390-075	075	Hi-vol/Energy-disp XRF (NEA)	EQL-0589-072	072			
Opsis AR 500, System 300 (open path)	EQSA-0495-101	101	Hi-vol/Flameless AA (EMSL/EPA)	EQL-0380-044	044			
Philips PW9700	EQSA-0876-011	511	Hi-vol/Flameless AA (Houston)	EQL-0895-107	107			
Philips PW9755	EQSA-0676-010	010	Hi-vol/Flameless AA (Omaha)	EQL-0785-059	059			
Thermo Electron 43	EQSA-0276-009	009	Hi-vol/ICAP spect. (Doe Run Co.)	EQL-0196-113	113			
Thermo Electron 43A or Thermo Environmental Instruments 43B, 43C	EQSA-0486-060	060	Hi-vol/ICAP spect. (EMSL/EPA)	EQL-0380-045	045			
Q₃ Analyzers								
Advanced Pollution Instr. 400	EQOA-0992-087	087	Hi-vol/ICAP spect. (Illinois)	EQL-1193-094	094			
Beckman 950A	RFOA-0577-020	020	Hi-vol/ICAP spect. (Kansas)	EQL-0592-085	085			
Bendix 8002	RFOA-0176-007	007	Hi-vol/ICAP spect. (Montana)	EQL-0483-057	057			
Columbia Scientific Industries 2000	RFOA-0279-036	036	Hi-vol/ICAP spect. (NE&T)	EQL-1188-069	069			
Dasibi 1003-AH,-PC,-RS	EQOA-0577-019	019	Hi-vol/ICAP spect. (New Hampshire)	EQL-1290-080	080			
Dasibi 1008-AH	EQOA-0383-056	056	Hi-vol/ICAP spect. (Pennsylvania)	EQL-0592-086	086			
Envirronics 300	EQOA-0990-078	078	Hi-vol/ICAP spect. (Pima Co.,AZ)	EQL-0995-109	109			
Environnement S.A. O ₃ 41M	EQOA-0895-105	105	Hi-vol/ICAP spect. (Pima Co.,AZ)	EQL-0995-110	110			
Horiba APOA-360	EQOA-0196-112	112	Hi-vol/ICAP spect. (Rhode Island)	EQL-0888-068	068			
Lear Siegler or Monitor Labs ML9810, Monitor Labs ML9810B, Wedding 1010	EQOA-0193-091	091	Hi-vol/ICAP spect. (Silver Val. Labs)	EQL-1288-070	070			
McMillan 1100-1	RFOA-1076-014	514	Hi-vol/ICAP spect. (West Virginia)	EQL-0694-096	096			
McMillan 1100-2	RFOA-1076-015	515	Hi-vol/WL-disp. XRF (CA A&IHL)	EQL-0581-052	052			
McMillan 1100-3	RFOA-1076-016	016	PM₁₀ Samplers					
Meloy OA325-2R	RFOA-1075-003	003	Rupprecht & Patashnick Partisol 2000	RFPS-0694-098	098			
Meloy OA350-2R	RFOA-1075-004	004	Oregon DEQ Medium volume sampler	RFPS-0389-071	071			
Monitor Labs 8410E	RFOA-1176-017	017	Sierra-Andersen/GMW 1200	RFPS-1287-063	063			
Monitor Labs or Lear Siegler 8810	EQOA-0881-053	053	Sierra-Andersen/GMW 321-B	RFPS-1287-064	064			
Opsis AR 500, System 300 (open path)	EQOA-0495-103	103	Sierra-Andersen/GMW 321-C	RFPS-1287-065	065			
PCI Ozone Corp. LC-12	EQOA-0382-055	055	Sierra-Andersen/GMW 241 Dichot.	RFPS-0789-073	073			
Philips PW9771	EQOA-0777-023	023	W&A/Thermo Electron Mod 600 HVL	RFPS-1087-062	062			
Thermo Electron or Thermo Environmental Instruments 49, 49C	EQOA-0880-047	047	PM₁₀ Analyzers					
CO Analyzers								
Advanced Pollution Instr. 300	RFCA-1093-093	093	Andersen Instruments Beta FH62I-N	EQPM-0990-076	076			
Beckman 866	RFCA-0876-012	012	R & P TEOM 1400, 1400a	EQPM-1090-079	079			
Bendix 8501-5CA	RFCA-0276-008	008	W&A/Thermo Electron 650 Beta Gauge	EQPM-0391-081	081			
Dasibi 3003	RFCA-0381-051	051	TSP Manual Method					
Dasibi 3008	RFCA-0488-067	067	Reference method (high-volume)	--	802			
Environnement s.a. CO11M	RFCA-0995-108	108						
Horiba AQM-10, -11, -12	RFCA-1278-033	033						
Horiba 300E/300SE	RFCA-1180-048	048						
Horiba APMA-360	RFCA-0895-106	106						
Lear Siegler or Monitor Labs ML9830, Monitor Labs ML9830B, Wedding 1020	RFCA-0992-088	088						
MASS - CO 1 (Massachusetts)	RFCA-1280-050	050						
Monitor Labs 8310	RFCA-0979-041	041						
Monitor Labs or Lear Siegler 8830	RFCA-0388-066	066						
MSA 202S	RFCA-0177-018	018						
Thermo Electron or Thermo Environmental Instruments 48, 48C	RFCA-0981-054	054						
NO_x Manual Methods								
Sodium arsenite (orifice)	EQN-1277-026	084						
Sodium arsenite/Technicon II	EQN-1277-027	084						
TGS-ANSA (orifice)	EQN-1277-028	098						
NO_x Analyzers								
Advanced Pollution Instr. 200	RFNA-0691-082	082						
Advanced Pollution Instr. 200A	RFNA-1194-099	099						